Distribution of polar upper atmospheric data and promotion of polar science by the IUGONET project

AUTHOR(S):

HAYASHI, Hiroo; TANAKA, Yoshimasa; HORI, Tomoaki; KOYAMA, Yukinobu; SHINBORI, Atsuki; ABE, Shuji; UMEMURA, Norio; ... MOTOBA, Tetsuo; TADOKORO, Hiroyasu; IUGONET project team

超高層大気長期変動の全球地上ネットワーク観測・研究

IUGONET

Distribution of polar upper atmospheric data and promotion of polar science by the IUGONET project

H. Hayashi[1], Y. Tanaka[2], T. Hori[3], Y. Koyama[4], A. Shinbori[1], S. Abe[5], N. Umemura[3], M. Yoneda[6], S. UeNo[7], N. Kaneda[7], M. Kagitani[6], T. Koun[8,3], D. Yoshida[9,4], T. Motoba[2], H. Tadokoro[10], and IUGONET project team

[1]RISH, Kyoto Univ., [2]NIPR, [3]STE Lab, Nagoya Univ., [4]WDC for Geomag., Kyoto, Kyoto Univ., [5]SERC, Kyushu Univ., [6]PPARC, Tohoku Univ., [7]Kwasan and Hida Obs., Kyoto Univ., [8]ISSP, Univ. of Tokyo, [9]Weather Information & Communications Service LTD., [10]Grad. Sch. Of Sci., Tohoku Univ.

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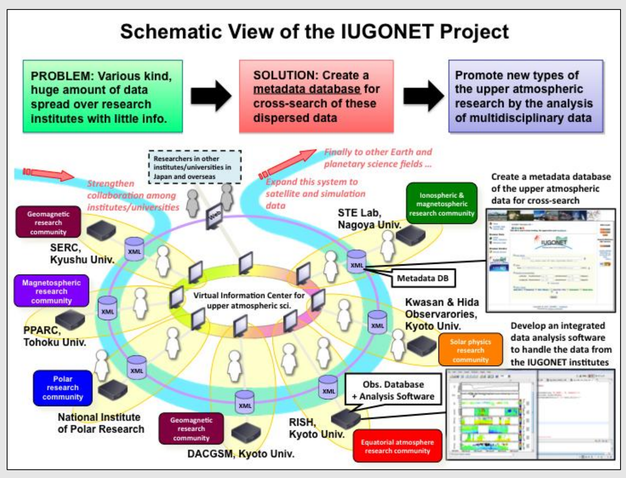
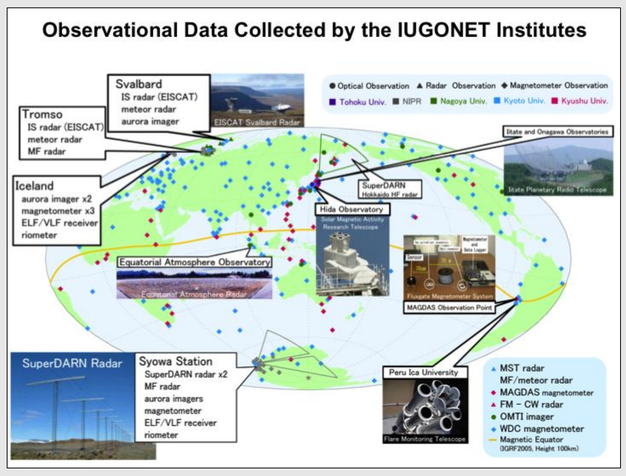
IUGONET project



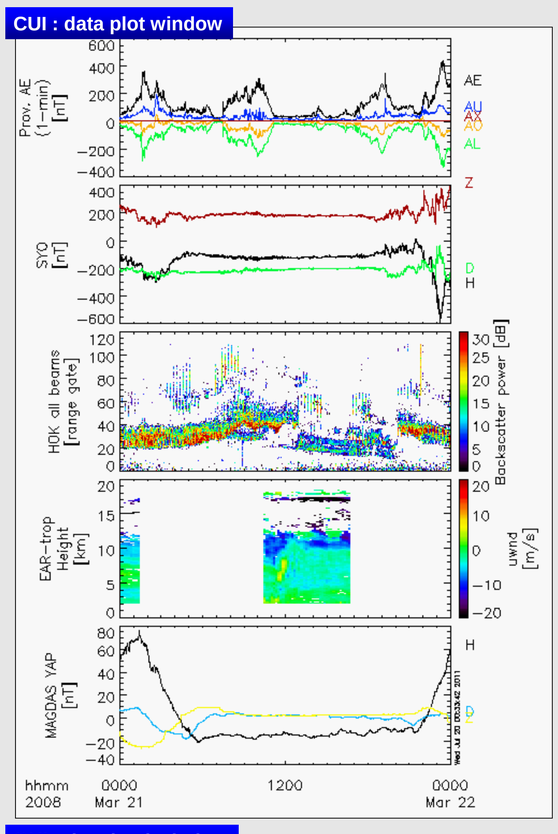


- The data or databases of ground-based observations of the upper atmosphere generally have been maintained and made available to the community by each research organization/group that conducted the observations.
- Although those data or databases have been well used within certain research communities closely related the observations, they are often difficult to be used by researchers belonging to the other research areas due to lack of information on the data.
- A six-year research project, **Inter-university Upper atmosphere Global Observation NETwork (IUGONET)** has started in 2009 to overcome such problems in data use by **NIPR and 4 universities (Tohoku, Nagoya, Kyoto and Kyushu)** in Japan.
- The IUGONET institutes archive a huge amount of and various kinds of ground-based observational data of the upper atmosphere and have formulated a cooperative framework to build the e-infrastructure to facilitate the distribution and use of their data.
- The IUGONET project intends to promote interdisciplinary studies, which would lead to more comprehensive understanding of the mechanism of long-term variations of the upper atmosphere.

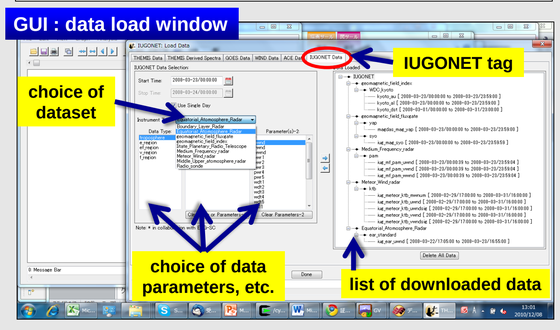
Data analysis software - UDAS -

UDAS can be downloaded from http://www.iugonet.org/software.html.

CUI : data plot window



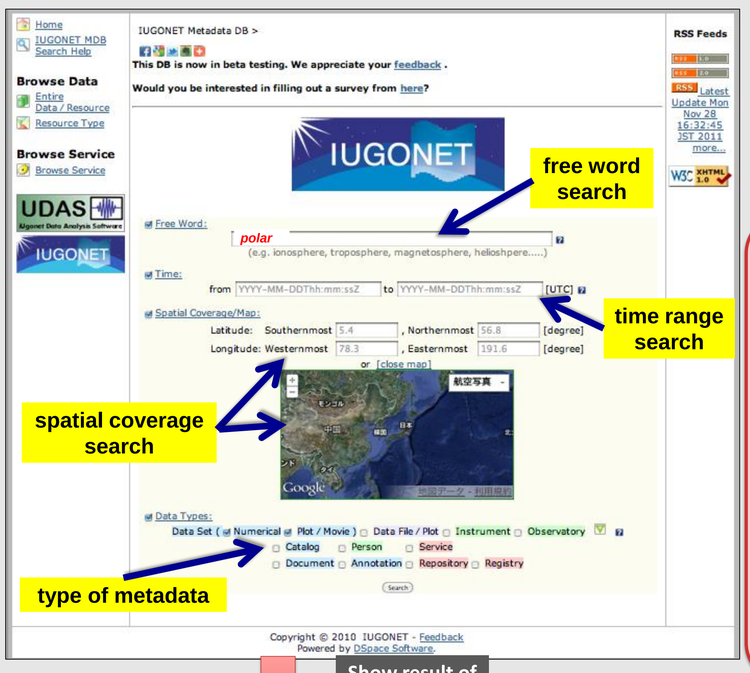
GUI : data load window



- UDAS is written in **IDL** (Interactive Data Language), which is widely used in the solar and terrestrial physics. We are developing the software on the basis of **TDAS** (THEMIS Data Analysis Software suite). UDAS is released as a plug-in software of TDAS to handle data provided from the IUGONET universities/institutes.
- TDAS contains a lot of useful functions to enable users to download, visualize, and analyze various kinds of data. It is easy to make multiple plots of time series in a single frame to compare various kind of data at one time.
- UDAS accesses IUGONET data through the Internet, and then the data are automatically downloaded onto the user's computer. The users can obtain the data without knowing the location of the file.
- Users don't have to take care of data formats when analyzing the data. The data downloaded and plots created can be exported to a variety of data format (ASCII, PNG, JPEG, PS, EPS, etc.).
- GUI (Graphical User Interface) as well as CUI (Character User Interface) is available so that even users who are not familiar with the data can readily visualize and analyze them.

Metadata database

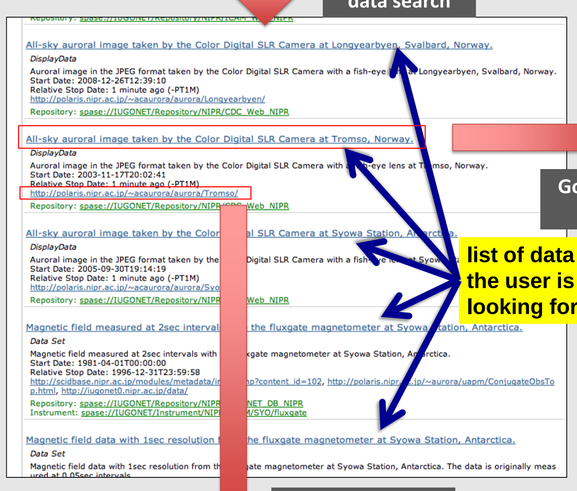
The IUGONET metadata database is available at http://search.iugonet.org/iugonet/.



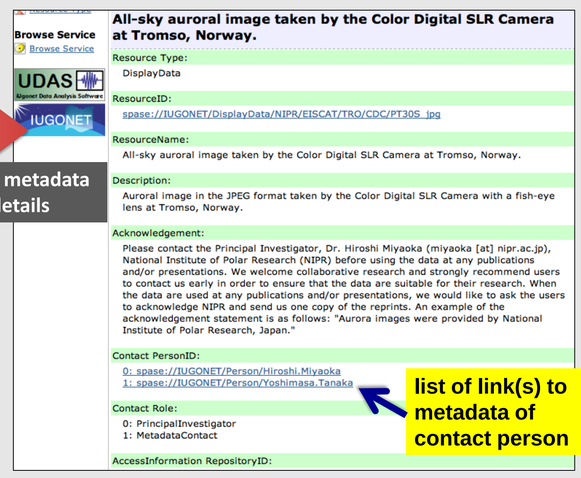
# of metadata registered
(as of Feb. 13th, 2012)
1,654,737
(* including metadata of data files)

- The IUGONET project adopted **DSpace** as the metadata database platform. DSpace is an open sourc software widely used by the digital repositories at many academic organizations over the world.
- The metadata are archived in the IUGONET common metadata format designed based on the **SPASE** (Space Physics Archive Search and Extract) data model with additional small modifications according to the characteristics of the ground-based observational data.

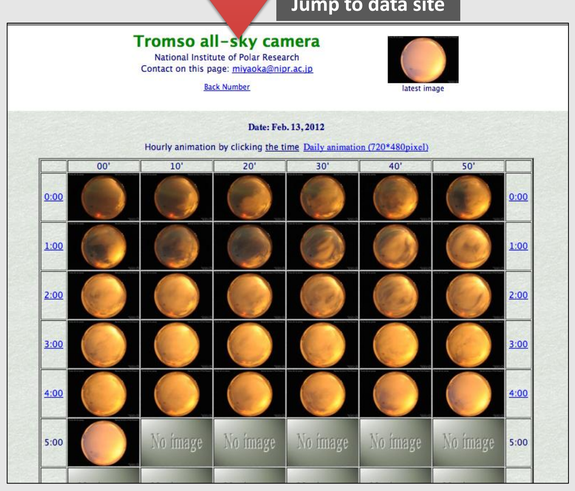
Show result of data search



Go to metadata details



Jump to data site



- The "search result" shows part of metadata - title, description, and access URL (if available) - of data that match input keyword(s), time range, and/or spatial coverage.
- The metadata "title" is a link to the metadata details which include at least link(s) to metadata of contact person responsible to the data.
- The "access URL" leads the user to the web site of the observational database. The user may be able to obtain the data files if they are available online.

Research with the IUGONET products

- We have started collaborative researches that use various kinds of observational data, including the polar upper atmospheric data, from the IUGONET institutes in order to examine and improve the developed metadata database and data analysis software.

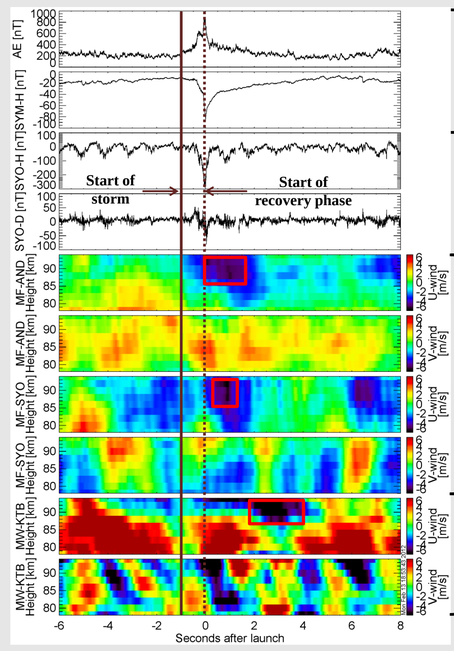
- An example of researches using the observational data in the polar regions provided by NIPR -

Background

A recent study on global ionospheric disturbance dynamo during storms (Zaka et al. [2010]) suggests that the E-region dynamo at an altitude of 85-125 km plays an important role in the geomagnetic field variations. In this study, we performed statistical analysis of **the wind data obtained by the MF and meteor wind radars over the polar regions and the equator**, in order to clarify temporal and spatial evolution of the neutral winds in the lower thermosphere and mesosphere (MLT) region.

Preliminary Results

This figure shows a composite analysis of neutral winds in the MLT region for the 36 storm events in 2005. The wind and geomagnetic field data are subtracted from the quiet day average every month. The significant enhancement of westward wind can be seen both in the polar regions (Syowa and Andenes) and at the equator (Kototabang) during geomagnetic storms, and persists for a few of days. The start time of the westward wind enhancement around 88-92 km at the equator is delayed about 1-2 days, compared to that in the polar regions.



Geomagnetic indices (AE and SYM-H) provided from WDC, Kyoto Univ.

Geomagnetic field at Syowa (H and D components) provided from NIPR

MLT wind data at Andenes and Syowa in the polar regions provided from NIPR

MLT wind data at Kototabang in the equatorial region provided from RISH , Kyoto Univ.

Summary

- The IUGONET project has been developing the e-infrastructure (**metadata database** and **data analysis software**) to facilitate the distribution and use of the ground-based upper atmospheric data provided by the IUGONET institutes.
  - Metadata database : http://search.iugonet.org/iugonet/
  - Data analysis software : http://www.iugonet.org/software.html
- The IUGONET project members has stared collaborative researches to self-evaluate the developed products and to demonstrate how to use them in the actual scientific studies.

Acknowledgement

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❖ We acknowledge the cooperation and generosity of the THEMIS Science Support Team in allowing us to use TDAS for our data analysis software (UDAS). UDAS has been developed in collaboration with the ERG Science Center.

NIPR Symposium on Conjugate Aurora and SuperDARN - Past, Present and Future -
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